

Univerza v Ljubljani

Prvenstvo
UNIVERZE V LJUBLJANI
v
programiranju

2002

2. krog



INNOVATIVE SOFTWARE SOLUTIONS
HERMES SoftLab



UNIVERZA V LJUBLJANI

Fakulteta za matematiko in fiziko

Pokrovitelji:

Prvenstvo v programiranju 2002

2. krog

3. junij 2002

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NAVODILA

Prijava: Prijavite se lahko le na en računalnik. Če bodo med tekmovanjem z njim slučajno težave, javite vodstvu tekmovanja. V primeru, da boste hkrati prijavljeni na dveh računalnikih, bo ekipa diskvalificirana.

Uporabniško ime je sestavljeno iz besede acm in številke računalnika.

Primer: uporabniško ime na računalniku št. 1 je: acm01

uporabniško ime na računalniku št. 12 je: acm12

Geslo je sporočeno pred začetkom tekmovanja.

Vaše domače področje na disku je /home/acmXX kjer je XX številka računalnika

Priprava delovnega okolja

Po uspešni prijavi morate odpreti dva terminala in program Netscape.

Terminal št.1: v njem boste pisali programe, prevajali programe in pošiljali programe sodniku.

Terminal št.2: v njem boste dobivali obvestila o pravilnosti rešitev in pošiljali morebitna vprašanja sodniku.

Program Netscape: bo omogočal pregled trenutne uspešnosti ekip

Pisanje programov:

Na voljo so urejevalniki besedil: *vi, joe, jed, mcedit, emacs, gedit in kedit*

Ime programov je točno določeno pri opisu nalog. Pazite na return 0, ki mora zaključiti vsak uspešno izveden C program.

Prevajanje programov:

Za prevajanje programov morate uporabljati naslednje prevajalnike:

C	(*c)	gcc	primer:	gcc -o program program.c
C++	(*cpp)	g++	primer:	g++ -o program program.cpp
Pascal	(*pas)	gpc	primer:	gpc -o program program.pas

Pošiljanje programov:

Za pošiljanje programov sodniku uporabljate ukaz submit.

Primer: submit program.c

Sporočila o napakah – PE in WA

Zaradi različnih razlogov je zelo težko razlikovati med Presentation Error in Wrong Answer. Ker preverjanje poteka več ali manj avtomatsko, program pogosto ne zna razlikovati med tem, ali ste le pozabili piko v odgovoru, ali pa ste napačno zračunali. Zato tudi Wrong Answer včasih lahko pomeni

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le manjkajoč znak v odgovoru. Praviloma naj bi sporočilo PE dobili le v primeru napačno postavljenih presledkov ali ločil in praznih vrstic, ni pa to nujno!

Komunikacija sodniki – ekipa:

V terminalu 2 izvedete ukaz: `telnet svarun`

Za prijavo na računalnik svarun uporabite isto uporabniško ime in geslo, kot ste ga uporabili za prijavo na vaš računalnik. V tem terminalskem oknu se bodo izpisovala sodnikova sporočila vam. Če želite poslati sporočilo sodniku, morate v tem terminalu napisati ukaz:

```
write sodnik
```

in potem sporočilo, ki ga zaključite s kombinacijo tipk CTRL + D na začetku prazne vrstice. Prosimo, da **ne** pošiljate sporočil tipa ... Sedaj smo poslali program ... in ... Naš program zagotovo dela, pa dobimo WA ... Ekipa, ki bo pošiljala tovrstna sporočila, je lahko tudi diskvalificirana.

Trenutni rezultati:

Program Netscape: bo omogočal pregled trenutne uspešnosti ekip

Po zagonu programa greste na naslov:

<http://svarun.fmf.uni-lj.si/index.html>

Kadar želite videti trenutno stanje, morate narediti »reload«.

Pritožbe:

So možne le takoj po zaključku tekmovanja. Kasneje se rezultati lahko spremenijo le v primeru drastične sodniške napake.

Preklapljanje med angleško in slovensko tipkovnico:

(Velja samo za okolje X windows)

Prednastavljena je slovenska tipkovnica. Za preklop na angleško tipkovnico v terminalu izvedete ukaz

```
setxkbmap us
```

za preklop nazaj na slovensko pa:

```
setxkbmap sl
```

Izbrana tipkovnica potem velja za celotno X okolje.

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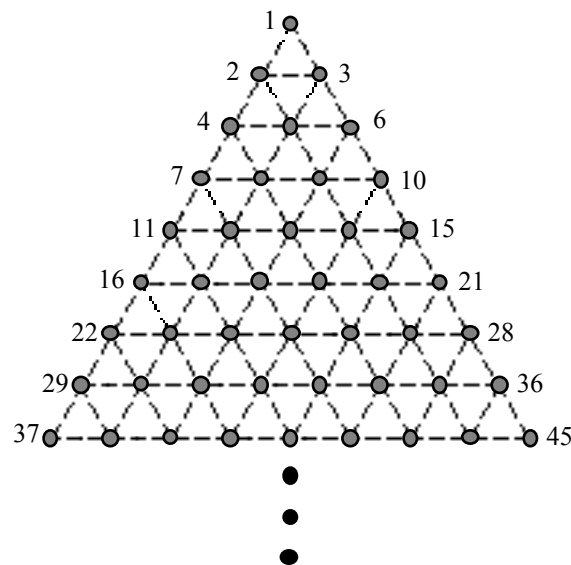
Triangular Vertices

Program

VERTICES.C, VERTICES.CPP, VERTICES.PAS

The problem

Consider the points on an infinite grid of equilateral triangles as shown below:



Note that if we number the points from left to right and top to bottom, then groups of these points form the vertices of certain geometric shapes. For example, the sets of points $\{1,2,3\}$ and $\{7,9,18\}$ are the vertices of triangles, the sets $\{11,13,26,24\}$ and $\{2,7,9,18\}$ are the vertices of parallelograms, and the sets $\{4,5,9,13,12,7\}$ and $\{8,10,17,21,32,34\}$ are the vertices of hexagons.

Write a program which will repeatedly accept a set of points on this triangular grid, analyze it, and determine whether the points are the vertices of one of the following “acceptable” figures: triangle, parallelogram, or hexagon. In order for a figure to be acceptable, it must meet the following two conditions:

- 1) Each side of the figure must coincide with an edge in the grid.
- and
- 2) All sides of the figure must be of the same length.

Input and Output

The input will consist of an unknown number of point sets. Each point set will appear on a separate line in the file. There are at most six points in a set and the points are limited to the range 1..32767.

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For each point set in the input file, your program should deduce from the number of points in the set which geometric figure the set potentially represents; e.g., six points can only represent a hexagon, etc. The output must be a series of lines listing each point set followed by the results of your analysis.

Sample Input

```
1 2 3
11 13 29 31
26 11 13 24
4 5 9 13 12 7
1 2 3 4 5
47
11 13 23 25
```

Sample Output

```
1 2 3 are the vertices of a triangle
11 13 29 31 are not the vertices of an acceptable figure
26 11 13 24 are the vertices of a parallelogram
4 5 9 13 12 7 are the vertices of a hexagon
1 2 3 4 5 are not the vertices of an acceptable figure
47 are not the vertices of an acceptable figure
11 13 23 25 are not the vertices of an acceptable figure
```



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The ? 1 ? 2 ? ... ? n = k problem

Program

PROBLEM.C, PROBLEM.CPP, PROBLEM.PAS

The problem

Given the following formula, one can set operators '+' or '-' instead of each '?', in order to obtain a given k :

$$? 1 ? 2 ? \dots ? n = k$$

For example: to obtain $k = 12$, the expression to be used will be:

$$- 1 + 2 + 3 + 4 + 5 + 6 - 7 = 12 \quad \text{with } n = 7.$$

The Input

Input contains a number of integers k ($0 < |k| \leq 1000000000$), each on a separate line. The input ends with a zero.

The Output

For each input k , your program should print the minimal possible n ($1 \leq n$) to obtain k with the above formula.

Sample Input

```
12
-3646397
0
```

Sample Output

```
7
2701
```

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Marking up

Program

MARKUP.C, MARKUP.CPP, MARKUP.PAS

The problem

Mark-up languages are computer languages that assist in the formatting of text files. Special keywords are used to mark the text to allow control of fonts, page styles, paragraph styles, etc. TeX, troff, and HTML are examples of mark-up languages.

Spell checking can be difficult to adapt to these special texts. In general, special processors or spell checkers must be created in order to accommodate mark-up languages. A special processor would recognize the mark-up language and strip it from the text so that the "plain" text could then be processed by a spell checker. For this problem, you are to write such a processor for a small mark-up language so that the output of your program will be the plain text without the mark-ups.

The mark-up language to consider is one which allows the modification of fonts within the text. Each markup command will be preceded by a `\` character. If the letter following the `\` character is not a recognized command from the table below then the character following the `\` is printed as part of the plain text. For instance, the mark-up `\\` can be used to print a single `backslash`.

- `\b` toggle bold font on/off (default state is off)
- `\i` toggle italics font on/off (default state is off)
- `\s` set font size; the `s` is immediately followed by an optional number; if the number is missing then the command will restore the previous size
- `*` toggle processing of mark-ups on/off; if processing is toggle off then mark-ups are considered to be literal text (default state is on)

The number following the `\s` command can have a decimal point so 12, 9.5, 11., and .5 should all be recognized as valid numbers.

The input file will be plain text containing mark-ups from the language above. At the start, processing of mark-ups should be on. The file should be processed until the end-of-file is encountered.

Sample input

```
\s18.\bMARKUP sample\b\s
\*For bold statements use the \b command.\*
If you wish to \emphasize\i something use the \i command.
For titles use \s14BIG\s font sizes, 14 points usually works well.
Remember that all of the commands toggle except for the \s command.
```

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Sample output

MARKUP sample

For bold statements use the `\b` command.

If you wish to emphasize something use the `\i` command.

For titles use BIG font sizes, 14 points usually works well.

Remember that all of the commands toggle except for the `\s` command.

The Twin Towers

Program

TOWERS.C, TOWERS.CPP, TOWERS.PAS

The problem

Once upon a time, in an ancient Empire, there were two towers of dissimilar shapes in two different cities. The towers were built by putting circular tiles one upon another. Each of the tiles was of the same height and had integral radius. It is no wonder that though the two towers were of dissimilar shape, they had many tiles in common.

However, more than thousand years after they were built, the Emperor ordered his architects to remove some of the tiles from the two towers so that they have exactly the same shape and size, and at the same time remain as high as possible. The order of the tiles in the new towers must remain the same as they were in the original towers. The Emperor thought that, in this way the two towers might be able to stand as the symbol of harmony and equality between the two cities. He decided to name them the *Twin Towers*.

Now, about two thousand years later, you are challenged with an even simpler problem: given the descriptions of two dissimilar towers you are asked only to find out the number of tiles in the highest twin towers that can be built from them.

Input

The input file consists of several data blocks. Each data block describes a pair of towers.

The first line of a data block contains two integers N_1 and N_2 ($1 \leq N_1, N_2 \leq 100$) indicating the number of tiles respectively in the two towers. The next line contains N_1 positive integers giving the radii of the tiles (from top to bottom) in the first tower. Then follows another line containing N_2 integers giving the radii of the tiles (from top to bottom) in the second tower.

The input file terminates with two zeros for N_1 and N_2 .

Output

For each pair of towers in the input first output the twin tower number followed by the number of tiles (in one tower) in the highest possible twin towers that can be built from them. Print a blank line after the output of each data set.

Sample Input

```
7 6
20 15 10 15 25 20 15
15 25 10 20 15 20
8 9
10 20 20 10 20 10 20 10
20 10 20 10 10 20 10 10 20
0 0
```

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Sample Output

Twin Towers #1
Number of Tiles : 4

Twin Towers #2
Number of Tiles : 6

Galactic Import

Program

IMPORT.C, IMPORT.CPP, IMPORT.PAS

The problem

With the introduction of the new ThrustoZoom gigadimensional drive, it has become possible for HyperCommodities, the import/export conglomerate from New Jersey, to begin trading with even the most remote galaxies in the universe. HyperCommodities wants to import goods from some of the galaxies in the Plural Z sector. Planets within these galaxies export valuable products and raw materials like vacuuseal, transparent aluminum, digraphite, and quantum steel. Preliminary reports have revealed the following facts:

- Each galaxy contains at least one and at most 26 planets. Each planet within a galaxy is identified by a unique letter from A to Z.
- Each planet specializes in the production and export of one good. Different planets within the same galaxy export different goods.
- Some pairs of planets are connected by hyperspace shipping lines. If planets A and B are connected, they can trade goods freely. If planet C is connected to B but not to A, then A and C can still trade goods with each other through B, but B keeps 5% of the shipment as a shipping fee. (Thus A only receives 95% of what C shipped, and C receives only 95% of what A shipped.) In general, any two planets can trade goods as long as they are connected by some set of shipping lines, but each intermediate planet along the shipping route keeps 5% of what it shipped (which is not necessarily equal to 5% of the original shipment).
- At least one planet in each galaxy is willing to open a ThrustoZoom shipping line to Earth. A ThrustoZoom line is the same as any other shipping line within the galaxy, as far as business is concerned. For example, if planet K opens a ThrustoZoom line to Earth, then the Earth can trade goods freely with K, or it can trade goods with any planet connected to K, subject to the usual shipping fees.

HyperCommodities has assigned a relative value (a positive real number less than 10) to each planet's chief export. The higher the number, the more valuable the product. More valuable products can be resold with a higher profit margin in domestic markets. The problem is to determine which planet has the most valuable export when shipping fees are taken into account.

The input consists of one or more galaxy descriptions. Each galaxy description begins with a line containing an integer N which specifies the number of planets in the galaxy. The next N lines contain descriptions of each planet, which consist of:

1. The letter used to represent the planet.
2. A space.
3. The relative value of the planet's export, in the form $d.dd$.
4. A space.
5. A string containing letters and/or the character `*`; a letter indicates a shipping line to that planet, and a `*` indicates a willingness to open a ThrustoZoom shipping line to Earth.



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For each galaxy description, output a single line which reads "Import from P" where P is the letter of the planet with the most valuable export, once shipping fees have been taken into account. (If more than one planet have the same most valuable export value then output the planet which is alphabetically first).

Sample input

```
1
F 0.81 *
5
E 0.01 *A
D 0.01 A*
C 0.01 *A
A 1.00 EDCB
B 0.01 A*
10
S 2.23 Q*
A 9.76 C
K 5.88 MI
E 7.54 GC
M 5.01 OK
G 7.43 IE
I 6.09 KG
C 8.42 EA
O 4.55 QM
Q 3.21 SO
```

Sample output

```
Import from F
Import from A
Import from A
```